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IT643: Software Design and Testing

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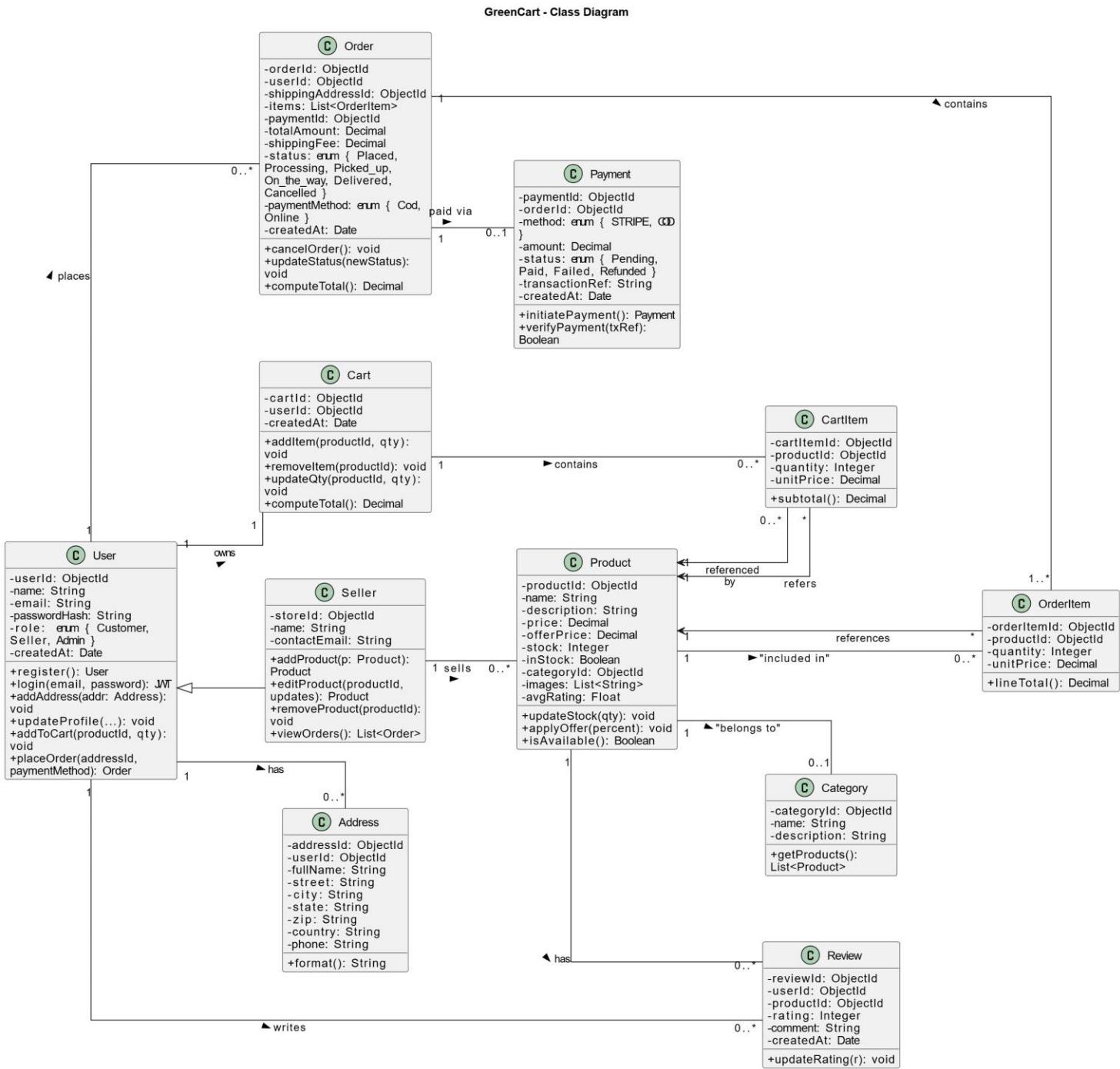
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Class Diagram



Class Diagram Documentation – GreenCart

1. Introduction

The Class Diagram of the GreenCart application represents the static structure of the system by illustrating its major classes, attributes, operations, and the relationships among them. This diagram provides a clear overview of how various components interact within the application, including user management, product catalog, shopping cart, orders, payments, and reviews. The objective is to visualize system behavior and support effective development, maintenance, and scalability.

2. Classes And Their Descriptions

2.1 User

Attributes

- userId: ObjectId
- name: String
- email: String
- passwordHash: String
- role: enum { CUSTOMER, SELLER, ADMIN }

- `createdAt: Date`

Methods

- `register(): User`
- `login(email, password): JWT`
- `addAddress(addr: Address): void`
- `updateProfile(...): void`
- `addToCart(productId, qty): void`
- `placeOrder(addressId, paymentMethod): Order`

2.2 Seller

(Represents a User with selling privileges)

Attributes

- `storeId: ObjectId`
- `name: String`
- `contactEmail: String`

Methods

- `addProduct(p: Product): Product`
- `editProduct(productId, updates): Product`
- `removeProduct(productId): void`
- `viewOrders(): List<Order>`

2.3 Product

Attributes

- `productId: ObjectId`

- name: String
- description: String
- price: Decimal
- offerPrice: Decimal
- stock: Integer
- inStock: Boolean
- categoryId: ObjectId
- images: List<String>
- avgRating: Float

Methods

- updateStock(qty): void
- applyOffer(percent): void
- isAvailable(): Boolean

2.4 Category

Attributes

- categoryId: ObjectId
- name: String
- description: String

Methods

- getProducts(): List<Product>

2.5 Cart

Attributes

- cartId: ObjectId
- userId: ObjectId
- createdAt: Date

Methods

- addItem(productId, qty): void
- removeItem(productId): void
- updateQty(productId, qty): void
- computeTotal(): Decimal

2.6 CartItem

Attributes

- cartItemId: ObjectId
- productId: ObjectId
- quantity: Integer
- unitPrice: Decimal

Methods

- subtotal(): Decimal

2.7 Order

Attributes

- orderId: ObjectId
- userId: ObjectId
- shippingAddressId: ObjectId

- items: List<OrderItem>
- paymentId: ObjectId
- totalAmount: Decimal
- shippingFee: Decimal
- status: enum { PLACED, PROCESSING, PICKED_UP, ON_THE_WAY, DELIVERED, CANCELLED }
- paymentMethod: enum { COD, ONLINE }
- createdAt: Date

Methods

- cancelOrder(): void
- updateStatus(newStatus): void
- computeTotal(): Decimal

2.8 OrderItem

Attributes

- orderItemId: ObjectId
- productId: ObjectId
- quantity: Integer
- unitPrice: Decimal

Methods

- lineTotal(): Decimal

2.9 Address

Attributes

- addressId: ObjectId
- userId: ObjectId
- fullName: String
- street: String
- city: String
- state: String
- zip: String
- country: String
- phone: String

Methods

- format(): String

2.10 Payment

Attributes

- paymentId: ObjectId
- orderId: ObjectId
- method: enum { STRIPE, COD }
- amount: Decimal
- status: enum { PENDING, PAID, FAILED, REFUNDED }
- transactionRef: String
- createdAt: Date

Methods

- initiatePayment(): Payment
- verifyPayment(txRef): Boolean

2.11 Review

Attributes

- reviewId: ObjectId
- userId: ObjectId
- productId: ObjectId
- rating: Integer
- comment: String
- createdAt: Date

Methods

- updateRating(r): void

3. Relationships and Cardinalities

- **User – Address**

A User *has* 0..* Addresses, whereas each Address belongs to exactly one User.

- **User – Cart**

A User *owns* exactly one Cart. Each Cart corresponds to one User.

- **Cart – CartItem**

A Cart *contains* 0..* CartItems. Each CartItem is associated with one Cart.

- **CartItem – Product**

A CartItem *refers to* one Product. A Product can be referenced by 0..* CartItems.

- **Product – OrderItem**

A Product is *included in* 0..* OrderItems. Each OrderItem references exactly one Product.

- **Order – OrderItem**

An Order *contains* 1..* OrderItems. Each OrderItem belongs to one Order.

- **User – Order**

A User *places* 0..* Orders. Each Order is placed by one User.

- **Order – Payment**

An Order may be *paid via* 0..1 Payment. Each Payment corresponds to one Order.

- **Seller – Product**

A Seller *sells* 0..* Products. A Product is sold by one Seller (based on role).

- **Product – Category**

A Product *belongs to* 0..1 Category. A Category may contain many Products.

- **User – Review**

A User *writes* 0..* Reviews. Each Review is written by exactly one User.

- **Product – Review**

A Product *has* 0..* Reviews. Each Review is associated with one Product.

4. Summary

The GreenCart Class Diagram provides a detailed representation of the structural design of the system. It highlights the interaction

between various components such as Users, Sellers, Products, Cart, Orders, Payments, and Reviews. By clearly defining the relationships and responsibilities of each class, the diagram ensures proper understanding of the system's architecture and supports effective system development and maintenance.